

## CLAIMS

We claim:

- 1           1.     A gasification reactor vessel, comprising:  
2                     a pressure shell, said pressure shell having an encircling body wall and  
3     shell ends at each of opposite ends of the body wall;  
4                     a plurality of cooling ducts extending around an outer surface of said  
5     body wall, said ducts being fixedly connected to said outer surface, interior spaces of said  
6     cooling ducts communicating with said outer surface;  
7                     a fluid supply conduit communicating with said cooling ducts;  
8                     a fluid discharge conduit communicating with said cooling ducts; and  
9                     a lining of a refractory encircling an inner surface of said encircling  
10    body wall.
  
- 1           2.     A gasification reactor vessel according to claim 1, wherein each cooling  
2     duct comprises a pair of spaced webs fixedly connected at common edges of each to said body  
3     wall outer surface, and an arcuate segment joining opposite edges of said webs.
  
- 1           3.     A gasification reactor vessel according to claim 2, wherein the webs of  
2     each duct are fixedly connected to said body wall outer surface with welded connections.
  
- 1           4.     A gasification reactor vessel according to claim 2, wherein said ducts  
2     extend longitudinally of said body wall, said fluid supply and fluid discharge conduits are  
3     annular and located, respectively, at one of two opposite ends of said shell body.

1                   5.     A gasification reactor vessel according to claim 4, wherein said ducts  
2 each are spaced on said body wall outer surface circularly from ducts adjacent thereto.

1                   6.     A gasification reactor vessel according to claim 4, wherein said ducts are  
2 arrayed circularly around said body wall outer surface with each duct in abutment with ducts  
3 adjacent thereto.

1                   7.     A gasification reactor vessel according to claim 2, wherein said ducts  
2 extend circularly around said body wall outer surface, said fluid supply and fluid discharge  
3 conduits being annular and disposed, respectively, at one of two opposite ends of said shell  
4 body .

1                   8.     A gasification reactor vessel according to claim 7, wherein said ducts are  
2 arranged obliquely of a central axis of said body wall.

1                   9.     A gasification reactor vessel according to claim 8, wherein said ducts  
2 extend in a spiral course around said body wall outer surface.

3                   10.    A gasification reactor vessel according to claim 7, wherein each duct  
4 encircles said body outer wall surface spaced from ducts adjacent thereto.

1                   11.    A gasification reactor vessel according to claim 1, wherein said  
2 refractory lining comprises at least two separate concentric layers of refractory material.

1                   12.    A gasification reactor vessel according to claim 11, wherein the  
2 refractory material is at least one of a ceramic and polytetrafluoroethylene.

1                   13.    A method for gasification of ash-free and low ash fuels, residues and  
2 waste comprising:  
3                    reacting said fuels, residues and waste with an oxygen-containing  
4 oxidizing agent in a reaction space of a pressure vessel of a fly stream reactor, said pressure  
5 vessel having a refractory lining therein: and  
6                    regulating a temperature of said pressure vessel so that said temperature  
7 is above a dew point temperature of any water contained in a gas atmosphere present in said  
8 reaction space.

1                   14.    A method according to claim 13 further comprising setting a pressure of  
2 the coolant flowable in said ducts irrespective of a pressure present in said reaction space,  
3 whereby the temperature of said pressure vessel can be regulated for maintaining said pressure  
4 vessel temperature above a dew point temperature in the reaction space.

1                   15.    A method according to claim 13, wherein the temperature of said  
2 pressure vessel is regulated to be more than at least about 5° C above the dew point of any gas  
3 atmosphere water present in said reaction space.

1                   16.    A method according to claim 13, wherein said pressure vessel has  
2 cooling ducts on an outer surface of said pressure vessel for regulating the temperature of said

- 3 pressure vessel with coolant flowable through said ducts, and regulating pressure vessel
- 4 temperature with coolant which is above or below coolant boiling point.